# FRESHWATER SHRIMP (*PALAEMONETES AUSTRALIS*) MAY BE INVOLVED IN GLOCHIDIA RELEASE FROM THE FRESHWATER MUSSEL (*WESTRALUNIO CARTERI*)

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On 27 November 2010 while snorkeling in Canebreak Pool, Margaret River I observed interesting interactions between freshwater shrimp (*Palaemonetes australis*) and freshwater mussels (*Westralunio carteri*). First, it is necessary to give a brief explanation of the life cycle of the Unionoidea, a superfamily within the order Unionoida, which are characterised by their larval type (Parodiz and Bonetto 1963).

Within the Unionoidea there are three families (Hyriidae, Margaritiferidae and Unionidae). Hyriidae are only found in the Australasian region and South America (Walker *et al.* 2001; Simone 2006; Graf and Cummings 2007; Bogan 2008). Males and females reproduce sexually. Fertilisation takes place within specialised pouches of the gills of females ('marsupia'), where embryos are brooded until they have developed into larvae, known as 'glochidia.' Glochidia are released in response to temperature change or other external stimuli, and then have a brief opportunity to attach to a host, generally a fish. The glochidia of Australian Hyriidae have specialised hooks, known as larval teeth, on the ventral edge of their shells to assist in attachment to the their host (Figure 1). The glochidia are encapsulated by host epithelial tissue and remain as parasites for a period of weeks to months then detach, falling to the river bottom as juveniles to begin life in the sediments (Kat 1984).

In regions where glochidia release has been studied in greater detail, a variety of tactics are utilised for glochidia dispersal. In North America, for example, some unionoids have modified mantles that resemble fish, which they use to attract host fishes through behavioural mimicry (Haag and Warren 1999; Corey *et al.* 2006; Barnhart *et al.* 2008; Zanatta and Murphy 2006); the Snuffbox Mussel (*Epioblasma triquetra*) (found in parts of Missouri, Tennessee, Minnesota, Wisconsin, Michigan (USA) and southern Ontario, Canada) even immobilises host fish between its valves and pumps glochidia into the gills of the trapped fish (Barnhart and Roston 2005). *Unio*

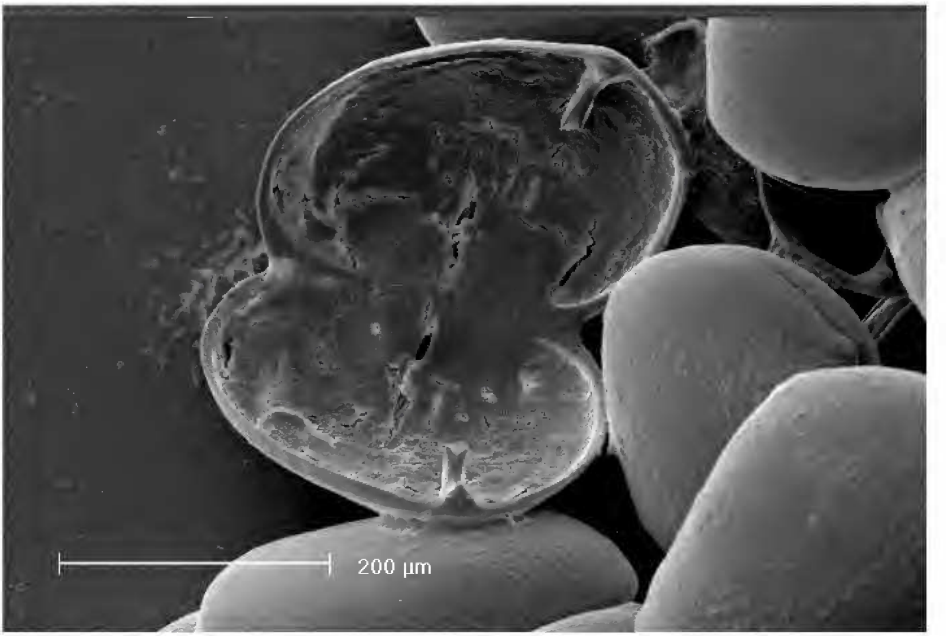


Figure 1. Scanning Electron Microscopy photo of glochidia retrieved from an adult freshwater mussel (*Westralunio carteri*). Photo: G. Thomson and M. Klunzinger.

*crassus*, another North American species, is known to venture into shallow waters and spurt water to disperse glochidia (Vicentini 2005). Some species even package glochidia into 'conglutinates' or 'ovisacs' which resemble prey items (e.g. Layzer *et al.* 2003). Some species' host infection strategies are more generalised, releasing glochidia on mucus strands or broadcast into the water column (e.g. Walker 1981; Hastie and Young 2003; Araujo *et al.* 2000).

The biology of reproduction, growth and ecology of *Westralunio carteri*, a Priority 4 (DEC 2010) species, has never been investigated and is the subject of my current PhD thesis at Murdoch University. Monthly sampling for reproductive biology (since 2009) shows that mature glochidia appear between October and December as water temperatures warm up. The mechanism of glochidia release is virtually unstudied in the Australian Hyriidae (Walker *et al.* 2001) but is probably by the same route as many other mussels which is via the suprabranchial canal exiting via the excurrent siphon, although superconglutinate species release glochidia through the incurrent aperature (Kat 1984).

To observe interactions between endemic freshwater fish and *W. carteri*, I had a look in Canebreak Pool, Margaret River using a mask

and snorkel. The site was chosen for its relatively large population of mussels, freshness, water clarity and near pristine conditions (Ashley Ramsay of ENVFusion Films, Inc., pers. comm.). I quietly hovered over a bed of mussels for approximately 20 minutes hoping to observe glochidia release. Western Pygmy Perch (*Nannoperca vittata*) were relatively abundant amongst the mussel beds, and some Western Minnows (*Galaxias occidentalis*) were also observed passing through the area. Shrimp were very busy cleaning the shells and sediments around the mussels, probably feasting on detritus or other organic matter. To my surprise, I observed a shrimp insert its claws inside the exhalent siphon of a mussel, shortly followed by a burst of light brown-tan coloured material from the mussel's exhalent siphon packaged in a string of mucus. This material looked similar to mucus-containing glochidia, which I had observed in mussels held in aquaria at the fish health unit, Murdoch University in early November 2010. The material shot out approximately 5 cm from the mussel. Unfortunately, I was not able to capture this material for analysis. I based my presumption on the fact that adult *W. carteri*, which I had examined on the same day contained mature glochidia within their marsupia. I suspect that the material which was released was probably glochidia and not mucus-containing pseudo-faeces because heavy particles taken in through the inhalant siphons are captured by mantle rejection currents and eliminated as pseudo-faeces through the ventral portion of the inhalant opening and not the exhalent opening (Avelar and Cunha 2008).

I accept that gravid female hyriids are responsive to most external stimuli, particularly when their soft tissues are caressed, and any such disturbance can elicit glochidia release. The high densities of *P. australis* I observed grazing on the shells of *W. carteri* are difficult to ignore. Our research group has video footage of *P. australis* attending mussel beds, which will be featured in a freshwater film public education series starting in August 2011; this will help to solidify my claims and will be available on www.musselwatchwa.com. Although the activities of these freshwater shrimp may not be obligatory for glochidia release, I believe it is fair to say that, at least in this particular pool, they could stimulate glochidia release as could fishes brushing up against the mussel. Furthermore, *P. australis* is a favoured food item, particularly of Nightfish (*Bostockia porosa*) (see Pen and Potter 1990), which are known to inhabit Canebreak Pool. I suspect that a Nightfish feeding on glass shrimp could stimulate glochidia release as well. Admittedly, these hypotheses are speculative and more research is required through observational study or laboratory experimentation, but I believe the observation is none-the-less worthy of reporting.

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